MPCE Costs for GGS

1. Technology Review
   a. Best Available Control Technology (BACT)
      i. Wet Scrubber for SO_2
      ii. Selective Catalytic Reduction (SCR) for NO_x
      iii. Powdered Activated Carbon (PAC) for Mercury
      iv. Baghouse for Particulate Matter
   b. "Bridge" Technologies
      i. Dry Sorbent Injection (DSI) for SO_2
      ii. Selective Non-Catalytic Reduction (SNCR) for NO_x
      iii. PAC for Mercury
      iv. Baghouse for Particulate Matter
2. Amount of Engineering Completed for each Technology for GGS
   a. Wet Scrubber: ~15% (conceptual engineering complete)
   b. SCR: ~20% (preliminary engineering/design)
   c. Baghouse: Complete
   d. DSI: <1% (high level studies)
   e. SNCR: <1% (high level studies)
   f. PAC ~20% (mostly GGS internal engineering/design)
3. Assumptions and Risks
   a. BACT
      i. Assumptions
         1. Use conservative design inputs (maximum heat input, dirty boiler conditions, etc) for equipment life of 20 years
         2. Remain able to burn all Powder River Basin (PRB) coals
         3. Ensure reliable, robust and proven design
         4. Achieve lowest possible emissions levels to meet current and future environmental regulations
      ii. Risks
         1. Due to the degree of engineering which has been completed, the complexities of this option are well understood.
         2. Serves as excellent front end for, but does not remove, greenhouse gases.
         3. Requires lengthy construction period (3-5 years for both units)
   b. "Bridge" Technologies
      i. Assumptions
         1. Not a BACT technology – would be used for a relatively short life span (5-10 years) for station shutdown scenario.
         2. Would not be a robust design since life span is limited.
         3. Lowest possible emissions not achievable nor required.
      ii. Risks
         1. Not much engineering completed for these technologies. To learn more would require extensive, unit-specific testing. A west coast plant had the use of DSI mandated by their state environmental

agency as a part of a "shutdown the plant by 2020" scenario. The plant spent nine months and $1.5 million preparing for and conducting the testing. The best SO_2 removal efficiency for them is 50-60%.

2. Not a lot of actual experience with DSI on large plants. Could have unintended consequences on baghouses or air heaters.
3. As alluded to earlier, emissions removal efficiencies for both DSI and SNCR are very unit-specific and are much lower than either wet scrubber or SCR.
4. Would require regulatory "sanctioning" since it is not BACT – may or may not get the "sanction".
5. Typical DSI and SNCR equipment have low capital costs, but very high O&M costs due to type and amount of reagent used.
6. Could limit which PRB coals could be burned.

4. GGS MPCE Assumptions Affecting Cost
   a. Assume Engineer, Procure, Construct